A Look at the IGS Predicted Orbit

J. F. Zumberge
Jet Propulsion Laboratory, California Institute of Technology
February 1998

The quality of the IGS predicted orbit has been assessed by comparing it to the IGS final orbit. For each satellite and day during the 6-week period beginning November 16, 1997, the 3-D rms difference over the day between the predicted and final orbit was computed. The distribution of this quantity is shown in Figure 1. Each count corresponds to one satellite and one day.

The median 3-D rms is 57 cm, which is approximately a factor of seven smaller than the corresponding number for the broadcast ephemeris. However, the high-end tail in Figure 1 – 8.5% are above 3 m – limits the use of the IGS predicted orbit. It would be beneficial to identify problematic satellites when the prediction is published.

It was found that poorly performing satellites are not well correlated with either (i) the smoothness of the broadcast ephemeris or (ii) time. There is, however, some correlation with prn, as indicated in Figure 2. For example, predictions of prn14 and prn23 are consistently poor. Although not indicated in Figure 2, the eclipse status is also a consideration, at least for some satellites. For example, the predictions for prn10 are typically worse when that satellite is in shadow.

With additional work, one might be able to develop a not-too-complicated algorithm using prn and shadow/sun status to flag many of the problematic satellite-days in the IGS predicted orbit. To realize the full potential of the IGS predicted orbit, however, one probably needs to use near-real-time data to flag the outlier satellites and days.

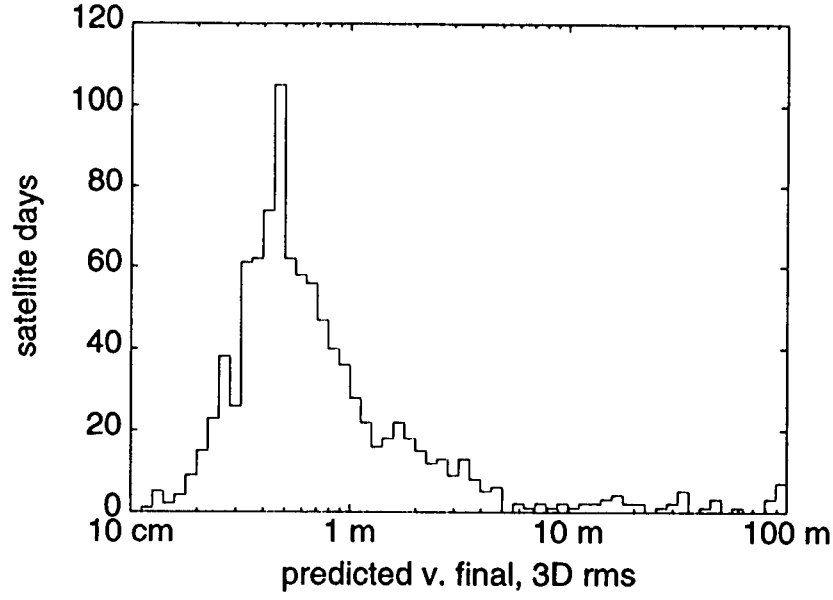

Figure 1: Distribution of the daily 3D-rms difference between the IGS predicted and final orbits.

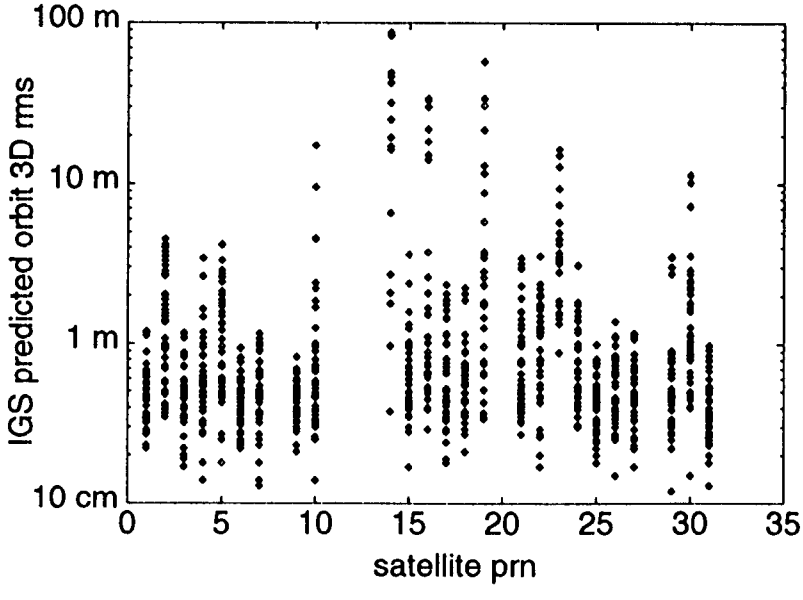

Figure 2: Correlation of predicted performance with prn.